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Journal of the Society of Arts.

FRIDAY, SEPTEMBER 13, 1867.

Announcements by the Council.

ARTIZANS' VISITS TO PARIS.

Her Majesty's Government have transmitted to the Society of Arts, in aid of the fund raised by the Society for assisting workmen, specially selected from various trades, to visit and report on the Paris Exhibition, the sum of £500, which was granted conditionally on the Society raising a like amount by public subscription.

The amount received up to the present time is as follows :—

H.R.H. THE PRINCE OF WALES, President	£31	10	0	£518	14	0
Society of Arts	105	0	0			
Other Subscriptions	382	4	0			
HER MAJESTY'S GOVERNMENT				500	0	0
Total				£1,018	14	0

Subscriptions may be forwarded to the Financial Officer, at the Society's House.

The following workmen have already been selected, and many of them are now in Paris :—

NAME.	TRADE.
Connolly, Thomas	Mason.
Lucraft, B.	Chairs and sofas.
Whiteing, Geo	Grainer and decorator.
Kay, Alexr.	Joiner.
McEwen, J.	Mason.
Forbes, G. B.	,,
Whiteing, Richd.	(Special reporter.)
Green, Aaron	Decorator.
Beardmore, Wm.	Potter.
Hooper, C. A.	Cabinet maker.
Blunt, Walter	Leather worker.
Walker, Wm.	Woodworking machinery.
Wilkie, Thos.	,, ,,
Booth, Laurence	Ribbon weaving.
Gutteridge, Joseph	,,
Gregory, John	Watch trade.
Stringer, James	,,
Stanton, George	Horticulturist.
Bird, Joseph	Lace trade.
Dexter, George	,,
Smith, Edward	,,
Kendall, George	Hosiery trade.
Caunt, Geo.	,,
Wilson, John	Cutlery.
Bramhall, Wm.	Saw maker.
Cooper, Samuel	Floor and wall tiles and pavements.
Coningsby, R.	(Special reporter.)
Evans, J.	Engineer.
Rosmüssen, P. A.	Silversmith.
Sinclair, R.	Tailor.
Bourne, W.	Foreman, india-rubber works.
Letheren, W.	Art metal workman.
Winstanley, T. W.	Architectural metal worker
Prior, J. D.	Carpenter.
Mondy, E. F.	Shipwright.
Jeffery, J.	Bricklayer.
Hughes, J. W.	Joiner.
Elliott, W.	Die-sinker.
Howell, G.	Bricklayer.
Bentley, J.	Ivory carver.
Berry, G.	Engraver.
Barrett, R.	Silver chaser.
Kirchoff, F.	Glass painter.
Jacob, T.	Cabinet draughtsman.
Page, G.	Silversmith.
Mackie, J.	Wood carver.
Baker, R.	,,
Genth, L.	Bookbinder.
Randall, J.	China painter.
Oats, Francis	Mining.
Jung, H.	Watchmaker.
Bartlett, Charles	Plasterer.
Learmouth, W.	Engineer.

SENT FROM BIRMINGHAM.

Taylor, J.	Gas-fitting, chandeliers, and lamps.
Bayley, Thomas	Plumbers' brass foundry.
Gorman, William	Cabinet ,, &c.
Dry, Henry	General ,,
Fowler, Henry	Labour-saving machines.
Clay, John	Saddles and bridles.
Thompson, Frederick	Harness and leather work.
Plampin, James	Jewellery and gilt toys.
Johnson, Thomas	Buttons.
Bridges, Wm.	Buttons, metal caps, tools, and metal ornaments.
Hibbs, Charles	Guns, &c.
Sargeant, David	Papier-maché, &c.
Archer, Thos.	Japanning.
Guise, Wm.	Needles and fish-hooks.
Pearsall, Richd.	Glass for glazing purposes, plate glass, &c.
Swene, W. S.	,, (fancy.)
Wilkinson, T. J.,	,, (practical manipula-
Moore, Chas. W.	Die-sinking.
Poole, Edwin	Tinplate-working.
Whitehouse, Benj.	Railway carriage building.
Jackson, F.	General ornament.
Deeley, W. J.	Jewellery, with diamonds and precious stones.
Fellows, Henry	Electro-plate and plated wares.
Petit, J. L.	Steel pens.
Ansell, James	Church and other bells.
Fisher, John	Gas and other tubes.
Dodd, J.	Chandeliers and gas-fittings.

Proceedings of the Society.

FOOD COMMITTEE.

The following on the preservation of meat by means of ice, appears in a leader in the *Daily Telegraph* of the 9th Sept. :—

" Before the cattle plague ' o'ercame us like a summer cloud,' and struck down the very flower of our flocks, the British public frequently agitated the question how best to preserve fresh meat imported from abroad, and so utilise the vast herds of South American pampas and the countless sheep on Australian ' runs.' The discussion is at least half-a-dozen years old, but no progress has yet been made. Meanwhile Brother Jonathan, who said nothing whatever on the subject, was quietly making up his mind, and while we talked he acted. He has, apparently, solved the problem in a most natural and simple way, and it is perfectly amazing that the idea should not yet have been practically tested in England. The Americans have only done what every London fishmonger does with his salmon. We are informed that a car, specially prepared for the transportation of fresh meat over long distances, is now running between Ohio and New York, and the preserving agent is ice, applied in large masses. By an ingenious contrivance, a current of air passes through the car from end to end; it is thus constantly renewed, and is always iced. The meat, being kept in a sort of Arctic temperature, remains perfectly free from even an approach to decay. Hence we are not at all surprised to learn, that when the refrigerating car had reached New York, at the end of four days' journey, its cargo of 16 steers and 123 sheep was as fresh as when killed. We are not told whether the flavour of the meat was preserved. The essential point is that a mode has now been discovered by which fresh-killed beef and mutton can be preserved for an indefinite period; the sole condition of success being an ample stock of ice. Science, which has already done so much, will certainly supply us with ice for the asking. We have thus the prospect of being able to secure importations of fresh meat from distances hitherto unattainable. If it can be kept for four days, it can, with due precautions, for forty, and that period would more than cover the gap between hungry Britain, with its many mouths, and the countries on the Plata, with their infinite resources. Let us trust that science and capital combined will some day bridge over the gap."

Proceedings of Institutions.

Yorkshire Union.—At a special meeting of the Central Council of the Yorkshire Union of Mechanics' Institutions, Mr. E. Baines, M.P., president, in the chair, it was unanimously resolved to institute an inquiry into the present means for the promotion of scientific and art education in Yorkshire, and to ascertain the opinion of the principal manufacturers and others as to what measures are required to increase and extend the means for the technical instruction of the managers and foremen of manufacturing establishments, as well as the more rudimentary scientific education of artisans. Among the instructions given by the president to Mr. Henry H. Sales, who is charged with the inquiry, are the following:—You will inquire chiefly into the instruction given in the classes of the several Institutions under these heads:—1. Design, and mechanical drawing. 2. Mathematics, especially as applied to mechanical art. 3. The principles of mechanics. 4. Chemistry, especially as applied to dyeing. You will learn distinctly whether the gentlemen whom you consult are of opinion that Mechanics' Institutions are calculated, if properly used, to effect the object in view, or whether it is essential to have some institution of a higher class, exclusively designed for scientific and art education, and supported partly (and to what extent) by the public funds. You must also endeavour to judge how far our artisans would avail themselves of the opportunities for technical education, if offered, and whether, if evening classes be insufficient, we must look to the means of supporting students during their period of study. You will also try to ascertain if it is thought that one central school would suffice for the West Riding, and whether it should be at Leeds; and then, whether the scientific classes of our Institutes should be maintained as preparatory to the higher school or college, and with certificates or exhibitions entitling the successful candidates to be admitted to the higher schools.

EXAMINATION PAPERS, 1867.

The following are the Examination papers set in the various subjects at the Final Examination held in April last:—

(Continued from page 649.)

GERMAN.

THREE HOURS ALLOWED.

Each candidate is expected to translate one of the extracts in Section I., to answer four of the questions in Section II., and to turn into German twelve of the sentences given in Section III. Candidates for a First Class must translate two pieces in Section I., one prose, the other poetry; answer (*e*), (*f*), and (*g*) of Section II.; render into German 17-20 inclusive of Section III., and work out the whole of Section IV.:—

Section I.

1. Mitten unter Verwundeten und Todten warf Gustav Adolph sich nieder, und die erste feurigste Siegesfreude ergosz sich in einem glühenden Gebete. Den flüchtigen Feind liesz er, so weit das tiefe Dunkel der Nacht es verstattete, durch seine Reiterei verfolgen. Das Geläute der Sturmglocken brachte in allen umliegenden Dörfern das Landvolk in Bewegung, und verloren war der Unglückliche, der dem ergrimmten Bauer in die Hände fiel. Mit dem übrigen Heere lagerte sich der König zwischen dem Schlachtfeld und Leipzig, da es nicht möglich war, die Stadt noch in derselben Nacht anzugreifen. Siebentausend waren von den Feinden auf dem Platze geblieben, über fünftausend theils gefangen, theils verwundet. Jhre ganze Artillerie, ihr ganzes Lager war erobert, über hundert Fahnen und Standarten erbeutet. Von den Sachsen wurden zweitausend, von den Schweden nicht über siebenhundert vermiszt. Die Niederlage der Kaiserlichen war so grosz, dasz Tilly auf seiner Flucht nach Halle und Halberstadt nicht über sechshundert Mann, Pappenheim nicht über vierhundert zusammenbringen konnte. So schnell war dieses furchtbare Heer zergangen, welches noch kürzlich ganz Italien und Deutschland in Schrecken gesezt hatte.

2. Wie, Sire, ist das die Sprache eines Königs?
Gibt man so eine Krone auf? Es setzt
Der Schlechtste deines Volkes Gut und Blut
An seine Meinung, seinen Hasz und Liebe;
Partei wird Alles, wenn das blut'ge Zeichen
Des Bürgerkrieges ausgehangen ist.
Der Ackersmann verläszt den Pflug, das Weib
Den Rocken, Kinder, Greise waffnen sich,
Der Bürger zündet seine Stadt, der Landmann
Mit eignen Händen seine Saaten an,
Um dir zu schaden oder wohl zu thun
Und seines Herzens Wollen zu behaupten.
Nichts schont er selber und erwartet sich
Nicht Schonung, wenn die Ehre ruft, wenn er
Für seine Götter oder Götzen kämpft.
Drum weg mit diesem weichlichen Mitleiden,
Das einer Königsbrust nicht ziemt.—Lasz du
Den Krieg ausrasen, wie er angefangen.
Du hast ihn nicht leichtsinnig selbst entflammt.
Für seinen König musz das Volk sich opfern,
Das ist das Schicksal und Gesetz der Welt.
Der Franke weisz es nicht und will's nicht anders.
Nichtswürdig ist die Nation, die nicht
Ihr Alles freudig setzt an ihre Ehre.

3. Des Atreus ält'ster Sohn war Agamemnon:
Er ist mein Vater. Doch ich darf es sagen,
In ihm hab' ich seit meiner ersten Zeit
Ein Muster des vollkommnen Manns gesehn.
Ihm brachte Klytämnestra mich, den Erstling
Der Liebe, dann Elektren. Ruhig herrschte
Der König, und es war dem Hause Tantals
Die lang' entbehrte Rast gewährt. Allein
Es mangelte dem Glück der Eltern noch
Ein Sohn, und kaum war dieser Wunsch erfüllt
Dasz zwischen Schwestern nun Orest
Der Liebling wuchs, als neues Uebel schon
Dem sichern Hause zubereitet war.
Der Ruf des Krieges ist zu euch gekommen,
Der, um den Raub der schönsten Frau zu rächen,
Die ganze Macht der Fürsten Griechenlands
Um Trojens Mauern lagerte. Ob sie
Die Stadt genommen, ihrer Rache Ziel
Erreicht, vernahm ich nicht. Mein Vater führte
Der Griechen Heer. In Aulis harrten sie
Auf günst'gen Wind vergebens; denn Diane,
Erzürnt auf ihren groszen Führer, hielt

Die Eilenden zurück und forderte
Durch Kalchas' Mund des Königs ält'ste Tochter.
Sie lockten mit der Mutter mich ins Lager;
Sie riszen mich vor den Altar und weihten
Der Göttin dieses Haupt.

4. Als Ludwig XII. im Jahre 1515 starb, folgte ihm der jugendlich kühne und ehrgeizige Franz. I. auf dem Französischen Throne; und um seine Regierung mit einer glänzenden That zu beginnen, brach er noch in demselben Jahre mit einem Heere nach Italien auf und eroberte Mailand wieder. Die Schweizer, welche der Stadt zu Hülfe kamen und sich unvorsichtig in ein Treffen einlieszen, wurden bei Marignano nach zwei heiszen Tagen besiegt. Es war die erste grosze Schlacht, die sie gänzlich verloren. Das französische Geschütz und die deutschen Lanzenknechte, die im französischen Solde dienten und von nun an als das beste Fuszvolk galten, gewannen den Sieg. Der Kaiser Maximilian zog zwar im folgenden Jahre noch einmal nach Italien und belagerte Mailand, allein sein Alter und so viele miszlungene Bestrebungen machten ihn zum Frieden geneigt; überdiesz schmolz sein Heer aus Mangel des Soldes schnell zusammen; er überliesz in dem Vergleich zu Brüssel im Jahre 1516 das Herzogthum Mailand dem französischen Könige und gab, was ihm fast noch empfindlicher war, der verhaszten Republik Venedig die wichtige Festung Verona zurück. So endigte sich nach vielfachem Wechsel der Streit in Italien, auf welchen Maximilian seine beste Kraft hatte verwenden müssen.

Section II.—Grammar and Idioms.

(a.) Show the derivation and meaning of every part of which the following are composed:—*Unaussprechliches, unwiderruflich, anbetungswürdig, bemerkenswerth.*

(b.) State the second person singular indicative in every tense of *haben* and *sein.*

(c.) Decline in every case, singular and plural, the German of—That rich man. Our beautiful land. Cold night.

(d.) Give the definite article with each of the following substantives, in the genitive singular, and the dative plural:—*Maus, Tochter, Haufe, Vetter, Bach, Wald.*

(e.) Give three examples where in English the passive, in German the reflective verb is used.

(f.) Conjugate the present and perfect of—*Dürfen, nehmen, bleiben, tragen, sehen.* Add also the first person singular of the imperfect and the participle past.

(g.) Was hat's gegeben?
Ich will dir Beine machen.
Er soll in sich gegangen sein.
Sie haben das Hasenpanier ergriffen.
Es ging bunt her.
Meinetwegen; was geht das mich an?
Der wird nie auf einen grünen Zweig kommen.
Er ist so blutjung und hat sich schon versprochen.
Das steht mir ganz und gar nicht an.
Er hat ihm ein X für ein U gemacht.
Ich kann mir das nicht zusammenreimen.
Das sind wahre Sonntagskinder.

Section III.

[The writing, either in English or German characters, must be thoroughly legible and distinct.]

1. I did not see those people you spoke of.
2. Were there many persons in the theatre?
3. The half of one-eighth is one-sixteenth.
4. One morning they were obliged to leave the town.
5. Do come to us to-morrow morning.
6. Who of us is to fetch your cloak?
7. Is that a cousin of yours or of hers?
8. With all his riches he could never be content.
9. At the appointed hour, he said, he would come to meet us.
10. He offered us a glass of wine.
11. He would sit down and write the whole morning.
12. Having sat down, he began to tell us a story.
13. What sort of house does he now live in?
14. We had never been told how that happened.
15. I could not believe that he had acted thus.
16. He wished me to go to his father and tell the circumstance.
17. How to express our thoughts we hardly know.
18. Had I been in your place, I would have acted differently.
19. Can you tell me, who has done this?
20. 1685. At the head of the English watering places, without a rival, was Bath. The springs of that city had been renowned from the days of the Romans. It had been, during many centuries, the seat of a bishop. The sick repaired thither from every part of the realm. The king sometimes held his court there. Nevertheless, Bath was then a maze of only four or five hundred houses, crowded within an old wall, in the vicinity of the Avon. Pictures of what were considered as the finest of those houses are still extant, and greatly resemble the lowest rag-shops and pot-houses of Radcliffe-highway. Even then, indeed, travellers complained of the narrowness and meanness of the streets. That beautiful city, which charms even eyes familiar with the masterpieces of Bramante and Palladio, and which the genius of Anstey and of Smollet, of Frances Burney and of Jane Austen, has made classic ground, had not begun to exist.

Section IV.

Questions on German History and Literature.

(a.) State the years of the reign of Maximilian I.

(b.) What was the league of the "Bundschuh," and "Des armen Kunzen?"

(c.) By what great discoveries is the close of the middle ages distinguished?

(d.) Who was Ulfila? When did he live? What has made him renowned?

(e.) What is the character of alliterative poetry, and when did it flourish?

(f.) What did Otfrid write?

Give, in German, a description of the destruction of a large warehouse by fire.

(To be continued.)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Dundee, 1867.

The following is a list of the Papers read in the different Sections:—

THURSDAY, SEPTEMBER 5th.

Section A.—Mathematical and Physical Science.

W. R. Birt—Report of Lunar Committee.

J. Glaisher—Some Remarks on the Original Objects and General Work of the Lunar Committee.

J. Clerk Maxwell—On a Real Image Stereoscope, with Illustrations of Solid Geometry.

Balfour Stewart—On the Behaviour of the Aneroid Barometer at Different Pressures.

Sehnor Capello—A comparison of the Kew and Lisbon Magnetic Curves during the Disturbance of February 20—25, 1866. Communicated by Dr. Balfour Stewart.

Rev. R. Harley—On a Certain Cyclical Symbol.

James Lindsay (the late)—Proof of the Binomial Theorem. Communicated by W. B. Grant.

F. W. Moffatt—On Meteorological Observations at Sea. Communicated by Dr. Moffatt.

J. Moffatt, M.D.—Experiments on the Luminosity of Phosphorus.

Dr. T. L. Phipson—On the Phenomena which occur when Magnetized Steel is Dissolved in Acids.

Section B.—Chemical Science.

President's Address.

A. R. Catton—Report on the Synthesis of Certain Organic Acids.

A. R. Catton—On the Synthesis of Formic Acid.

J. A. Wanklyn and R. Schenk—On the Synthesis of Caproic Acid.

J. A. Wanklyn—Action of Sodium on Valerianic and similar Ethers.

P. T. Main and A. R. Catton—On a new Synthesis of Ammonia.

J. Spiller—On the Decay of Stone.

W. Weldon—On the Regeneration of the Oxide of Manganese.

Section C.—Geology.

President's Address.

Robert Chambers, LL.D., F.R.S.E.—Notice of an "Esker" at St. Fort.

D. Milne Home—On the Old Sea Cliffs and Submarine Banks of the Firth of Forth.

E. A. Wünsch—On some Carboniferous Fossil Trees embedded in Trappean Ash, in the Isle of Arran.

Professor Harkness and Dr. H. A. Nicholson—On the Coniston Group of the Lake District.

Dr. H. A. Nicholson—On the Graptolites of the Skiddaw Slates.

Dr. H. A. Nicholson—On the Nature and Systematic Position of the Graptolitidæ.

R. H. Scott—Preliminary Report of the Committee for the Exploration of the Plant Beds of North Greenland.

Section D.—Biology (Department of Zoology and Botany).

Opening Address by the President of the Section.

C. Spence Bate—Report on the Fauna and Flora of the Southern Coasts of Devon and Cornwall.

J. Gwyn Jeffreys—Fourth Report on Dredging among the Shetland Isles.

Dr. Mörch—Notice of Dredging by the late Dr. Möller, off Fair Isle.

Dr. M'Intosh—Remarks on Mr. Gwyn Jeffreys' Collection of Hebridean Annelids.

Dr. C. Collingwood—On Palagic Floating Animals observed at Sea.

Dr. C. Collingwood—Notes on Oceanic Hydrozoa.

Dr. Anton Dohrn, of Jena—On the Morphology of the Arthropoda.

Section D.—Biology (Department of Anatomy and Physiology).

Professor Bennett—New Investigations to determine the Amount of the Bile secreted by the Liver, and how far this is influenced by Mercurials.

Professor Turner and Dr. M. Foster—To exhibit some preparations of the finest Bile Ducts.

Dr. Davy—On the Influence of Air on Vital Action as tested by the Air-pump.

Dr. G. Robinson—On certain Effects of the Concentrated Solar Rays upon the Tissues of Living Animals immersed in Water.

Dr. W. B. Richardson—On Coagulation of the Blood—a correction of the Ammonia Theory.

Section E.—Geography and Ethnology.

The President's Address.

Lieut. S. P. Oliver, R.A. — Two Routes through Nicaragua.

Mrs. Lynn Linton—The Ethnography of the French Exhibition.

Capt. Murray, U.S.N.—On the Physical Geography of Nicaragua.

J. Crawfurd—Food of the Aborigines of Australia.

Section F.—Economic Science and Statistics.

The President's opening Address.

Report of Committee on Uniformity of Weights, Measures, and Coins.

James Yates—Reasons why the Office of Warden of the Standards should include Standard Weights and Measures of the Metric System in addition to those of the Imperial Weights and Measures.

Sir John Bowring—On Productive Labour in Prisons as associated with the Reformation of Criminals.

James Oldham—On the Utilisation or more Profitable Employment of Male Convicts.

Section G.—Mechanical Science.

President's Address.

Report of Steamship Committee.

J. V. N. Bazalgette—On an improved "Tourists'" or "Local Topographical Indicator."

Joseph Mitchell, C.E. — On the Construction and Works of the Highland Railway.

John Fernie—On the Iron and Steel at the Paris Exhibition.

David Greig—On Steam Cultivation.

FRIDAY, SEPTEMBER 6th.

Section A.—Mathematical and Physical Science.

J. Glaisher—Report on Luminous Meteors.

Sir D. Brewster—On the Colours of Soap Bubbles.

Sir D. Brewster—On the Figures of Equilibrium in Liquid Films.

Sir D. Brewster—Notice respecting a Haystack struck with Lightning at Dun, in Forfarshire.

Dr. Everett—On the Results of Observations of Atmospheric Electricity at Kew, and Windsor, Nova Scotia.

W. Ladd—On a Dynamo-Magnetic Machine.

W. Ladd—On a Magneto-Electric Machine.

Sir W. Thomson—Electric Machines founded on Induction and Convection.

Professor Rankine—On the Approximate Drawing of Circular Arcs of Given Lengths.

Rev. R. Harley—On Finite Solutions of Algebraical Equations.

Hon. J. Cockle—On the Inverse Problem of Coresolvents, communicated by Rev. R. Harley.

A. Claudet—A New Fact of Binocular Vision.

A. Claudet—On a Mechanical Means of Producing the Differential Motion required to Equalise the Focus for the Different Planes of a Solid.

Section B.—Chemical Science.

Lauder Lindsay—On the Present Uses of Lichens as Dye Stuffs.

J. Alfred Wanklyn—On the Existence of Putrescible Matter in River and Lake Waters.

Dugald Campbell—A Note on Messrs. Wanklyn, Chapman, and Smith's Method of Determining Nitrogenous Organic Matters in Water.

A. E. Fletcher—On an Ether Anemometer for Measuring the Speed of Air in Flues and Chimneys.

A. E. Fletcher—On a Self-Registering Perpetual Aspirator.

G. Ansell—On an Apparatus for Indicating the Pressure and Amount of Fire Damp in Mines.

Professor Lawson—Notes of the Analyses of Gold Coins.

Section C.—Geology.

J. Wyatt—On the Gradual Alteration of the Coast Line in Norfolk.

George Maw—On the Cambrian Rocks of Llanberis, with reference to a Break in the Conformable Succession of the Lower Beds.

Dr. Oldham—On the Geology of India.

The President—An Account of the Process of the Geological Survey of Scotland.

H. Woodward—Third Report on Fossil Crustacea.

F. M. Burton—On the Lower Lias, and Traces of an Ancient Rhætic Shore in Lincolnshire.

J. E. Taylor—On the Norfolk Chalk-marl.

H. S. Ellis—On the Mammalian Remains from the Submerged Forest in Barnstaple Bay, Devonshire.

Section D.—Biology (Department of Zoology and Botany).

Dr. Cobbold—Remarks on the Entozoa of the Common Fowl and of Game Birds, in their supposed relation to the Grouse Disease.

E. Ray Lankester—Note on the Boring of Limestone by certain Annelids.

A. Murray—On the Future Administration of the Natural History Collections of the British Museum.

Sir J. Lubbock—On some Points in the Anatomy of Thysanura.

Dr. Lauder Lindsay—Is Lichen-growth any criterion of the Age of Pre-historic Structures?

Dr. Lauder Lindsay—Is Lichen-growth detrimental to Forest and Fruit Trees?

Dr. Maxwell T. Masters—On Polliniferous Ovules in a Rose *(Rosa arvensis)*.

Charles Martins—To Exhibit Specimens of the Air-Bearing Roots of *Tussiæa repens*, and Specimens of the Plant cultivated under different Biological Conditions.

Dr. Heaton—On certain Simulations of Vegetable Growths.

W. P. Hiern—On the Occurrence of *Aster salignus*, Willd., in Wicken Fen, Cambridgeshire.

Professor Dickson—To Exhibit an Abnormal Leaf of Prunus Lauro-cerasus.

Section D.—Biology (Department of Anatomy and Physiology).

Professor C. Martins—To Exhibit Osteological Preparations, with Photographs, to illustrate the Comparison of Limbs deduced by the Torsion of the Humerus.

Dr. Ogilvie—On the Adaptation of the Structure of the Shell of the Bird's Egg to the Function of Respiration.

Professor Turner—A Contribution to the Anatomy of the Pilot Whale.

Sir Duncan Gibb—Vocal and other Influences upon Mankind of the Pendency of the Epiglottis.

Dr. M'Intosh—Notes of Experiments with Poisons, &c., on Young Salmon.

Professor Bennett—On Protagon in Relation to the Molecular Theory of Organisation.

Dr. B. W. Richardson—On Some Effects produced by Applying Extreme Cold to certain Parts of the Nervous System.

Section E.—Geography and Ethnology.

Captain C. W. Wilson—Report of the Palestine Exploration Fund.

Captain C. W. Wilson—Recent Discoveries in and around the Site of the Temple at Jerusalem.

Lieutenant Anderson—Notes of a Reconnaisance of Some Portions of Palestine.

Rev. H. B. Tristram—On the Districts of Palestine as yet imperfectly Explored.

Sir R. I. Murchison—Observations on the Livingstone Search Expedition now in progress.

Professor D. T. Ansted—The Lagoons of Corsica.

Major R. Stuart, C.B.—The Wallachs of Mount Pindus.

Section F.—Economic Science and Statistics.

Professor Leone Levi—On the Condition and Progress of Scotland in Relation to England and Ireland in Population, Education, Wealth, Taxation, Crime, Consumption of Spirits, Savings Banks, &c.

Report of the Committee on the "Uniformity of Weights, Measures, and Coins" (so far as it relates to Coins).

Frank P. Fellowes—On the various Methods in which our Coinage may be Decimalized; the Advantages and Disadvantages of each.

Henry J. Ker Porter—On the Prevalence of Spedalske or Leprosy in the Kingdom of Norway.

Section G.—Mechanical Science.

Rev. Patrick Bell—On Reaping Machines.

Professor J. Clerk Maxwell—On the Theory of Diagrams of Forces as applied to Roofs and Bridges.

George Fawcus—On the Stowage of Ships' Boats.

George Maw—Covered Life Boats.

Professor Macdonald—On the Construction of the Life Boat.

John Halliday—On the Heating of Hot Houses.

Wm. Paterson—On the Consumption of Fuel.

J. D. Everett, D.C.L.—On the Rigidity of Glass, Steel, and Brass.

SATURDAY, SEPTEMBER 7th.

Section E.—Geography and Ethnology.

J. Crawfurd, F.R.S.—On the Antiquity of Man.

P. N. Compton—On the Coasts of Vancouver's Island and British Columbia.

J. J. Pratt—On the Colony of New Scotland.

J. Crawfurd, F.R.S.—On the Complexion, Hair, and Eyes as the Tests of the Races of Man.

J. Crawfurd, F.R.S.—On the supposed Aborigines of India, as distinguished from its Civilised Inhabitants.

H. H. Howarth, F.E.S.—On some Changes of Surface affecting Ancient Ethnography.

Captain Bedford Pim, R.M.—On the Mining District of Chontales, Nicaragua.

MONDAY, SEPTEMBER 9th.

Section A.—Mathematical and Physical Science.

G. J. Symons—Report of the Rainfall Committee.

Alexander Brown—Observations of the Rainfall at Arbroath.

John Thruston—On Evaporations from Rain Gauges.

Colonel Sykes—On Storm Warnings, their importance and practicability.

George Forbes—On the Meteor Shower of August, 1867.

Sir D. Brewster—On the Colours of Films of Alcohol.

Sir D. Brewster—On the Radiant Spectrum.

Sir D. Brewster—Notice respecting Mr. Macrae's Photographs upon Glass and Porcelain.

A. Claudet—Photographic Portraits obtained by Single Lenses of Rock Crystal and Topaz.

Section B.—Chemical Science.

A. Crum Brown—Remarks on the Calculus of Chemical Operations.

Maxwell Simpson—On the Formation of Succinic Acid from Ethylidine.

Maxwell Simpson and Gautier—On a Compound formed by the direct union of Anhydrous Prussic Acid and Aldehyde.

A. R. Catton—On Loewig's Researches on the action of Sodium Amalgam on Oxalic Ether.

I. Lowthian Bell—On a method of recovering Sulphur and Oxide of Manganese, used at Dieuze, near Nancy, France.

J. H. Gladstone—On the Refraction Equivalent of Salts in Solution.

J. Spiller—On certain New Processes of Photography.

W. Crookes—On a new Polarizing Photometer.

Section C.—Geology.

W. Pengelly—Third Report of the Committee for the Exploration of Kent's Cavern, Devonshire.

Professor Ansted—On the Conversion of Stratified Rock into Granite in the North of Corsica.

Dr. Julius Schvarcz—On the Internal Heat of the Earth.

Dr. C. Le Neve Foster—On the Preseberg Iron Mines, Sweden.

F. Gordon Davis—On the Calamine Deposits of Sardinia.

Dr. C. Collingwood—On the Geology of the North of Formosa.

Dr. C. Collingwood—Notes on the Geology of the Islands around the north part of Formosa.

SECTION D.—BIOLOGY (DEPARTMENT OF ZOOLOGY AND BOTANY.)

W. Carruthers—On British Fossil Cycadeæ.

A. R. Wallace—On Birds' Nests and their Plumage, or the relation between Sexual Differences of Colour and the mode of Nidification in Birds.

Dr. Collingwood—Observations on the Habits of Flying Fish.

Dr. Collingwood—On Trichodesmium, or Sea Dust.

Professor Allman—Notes on the Structure of certain Hydroid Medusæ.

Dr. M'Intosh—Report on the Marine Fauna of St. Andrews.

Dr. M'Intosh—The Annelidæ of St. Andrews.

W. Stephen Mitchell—Report on the Leaf Beds of the Lower Bagshot Beds of Hants and Dorset.

W. Brown—On the claims of Arboriculture as a Science.

SECTION D.—BIOLOGY (DEPARTMENT OF ANATOMY AND PHYSIOLOGY).

Dr. B. W. Richardson—Report on Methyl Compounds.

E. Ray Lankester—Observations with the Spectroscope on Animal Colouring Matters.

Professor Allen Thomson—Exhibited Microscopical Preparations of the Cochlea, of the Retina, and of Teeth of Fossil Fishes.

Dr. Polli—On the Antiseptic Properties of the Sulphides.

Professor Cleland—On the Epithelium of the Cornea of the Ox in relation to the growth of Stratified Epithelium.

Professor Cleland—On some points connected with the Joints and Ligaments of the Hand.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Sir John Lubbock, Bart., F.R.S.—On the Origin of Civilization and the Early Condition of Man.

Messrs. Wallace and Mayne—A Peruvian Expedition to the River Ucayali.

Dr. Collingwood—A Boat Journey round the Northern end of Formosa.

Dr. John Davy—On the Character of the Negro, chiefly in relation to Industrial Habits.

T. Baines—On Wallfish Bay and the Ports of South Africa.

J. Crawfurd, F.R.S.—On the Dissemination of the Arabian Race and Language.

H. H. Howarth, F.E.S.—On the Origines of the Norsemen.

H. C. Criswick—Life amongst the Veys.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Alex. J. Warden—On the Linen Manufacture of Dundee.

James G. Orchar—On the Engineering Trade of Dundee.

Henry Gourlay—On the Iron Shipbuilding of Dundee.

James Yeaman—On the Seal and Whale Fisheries of Dundee.

Frank Henderson—On the Leather Manufacture of Dundee.

C. C. Maxwell—On the Confectionary and Marmalade Trade of Dundee.

A. Robertson—Statistics of the Social Condition of Dundee.

E. Renals—On Arbitration in the Nottingham Hosiery Manufacture.

Dr. Lauder Lindsay—On the Obstacles to the Utilization of New Zealand Flax.

A. Stephen Wilson—On the Measure and Value of Oats.

SECTION G.—MECHANICAL SCIENCE.

Report of the Committee on the Patent Laws.

Wm. Fairbairn, C.E., LL.D., &c.—Report on Experimental Researches on the Mechanical Properties of Steel in its present improved State of Manufacture.

G. B. Galloway—On the Application of the Funds derived from Patent Fees.

General Haupt, U.S. America—On the Application of Machinery to Boring and Tunnelling.

Dr. C. Le Neve Foster—An account of Bergstroem's Boring Machine used at the Preseberg Mines, Sweden.

Joseph Mitchell, C.E., F.R.S.E.—On a New Mode of Constructing the Surface of Streets and Thoroughfares.

Latimer Clark, C.E.—On the Birmingham Wire Gauge.

TUESDAY, SEPTEMBER 10TH.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

C. Meldrum—On the Meteorology of the Mauritius.

C. Meldrum—On the Hurricanes of the Indian Ocean.

F. Jenkin—Report of the Committee on Electrical Standards.

J. P. Joule—Determination of the Mechanical Equivalent of Heat, from Experiments on the Heat Evolved by Currents of Electricity.

C. W. Siemens—On a Resistance Measurer.

J. Jenkin—On a Modified Form of Siemen's Resistance-measurer.

C. Hockin—Examination of the Permanency of the Standard Resistance Coils to be deposited at the Kew Observatory.

Sir William Thomson—On a Series of Electrometers for Comparable Measurements through great range.

W. Hooper—On the Electrical Induction of Hooper's Insulated Wires.

Thomas Stevenson—Notice of a proposal to illuminate Beacons and Buoys at Sea by Electricity conveyed by Submarine Wires connected with the Shore.

T. Archer Hirst—On the alleged Correspondence between Newton and Pascal recently communicated to the French Academy.

Sir David Brewster—On the alleged Correspondence between Pascal and Newton. (The letters of Newton were exhibited.)

Sir Wm. Thomson—On Volta-convection by Flame.

Sir Wm. Thomson—On a Self-acting Electrostatic Accumulator.

Sir Wm. Thomson—On a Uniform Electric Current Accumulator.

Bierens de Haan—On a Theorem in the Integral Calculus.

B. Davis—A list of 5,500 Prime Numbers.

A. R. Catton—On the Laws of Symmetry of Crystalline Forms.

A. R. Catton—A Contribution towards the Expression of the Angle between the Optic Axes of a Crystal in terms of the Angles between the Faces.

A. R. Catton—On the Theory of Double Refraction, with special reference to the Influence of the Material Molecules on the Propagation of Light in Crystals.

N. de Khanikof—Experiments for the Verification of the Law of Henry and Dalton on the Absorption of Gases by Liquids.

SECTION B.—CHEMICAL SCIENCE.

I. Lowthian Bell—On the Present State of the Manufacture of Iron in Britain, and its position as compared with that of some other countries.

J. B. Lawes and J. H. Gilbert—Preliminary Notice of Results on the Composition of Wheat, grown for Twenty Years in succession on the same Land.

R. F. Smith—On the Gaseous Products of the Destructive Distillation of Hydro-carbons, obtained from Shales and Coals at Low and High Temperature.

P. Spence—On the Economisation of the Sulphurous Acid in Copper Smelting.

W. L. Scott—On the Bisulphite of Calcium as a Preservative of Animal Substances.

W. L. Scott—Note on the Artificial Production of Oil of Cinnamon.

T. T. P. Bruce Warren—On the Electrical Resistances of the Fixed and Volatile Oils.

SECTION C.—GEOLOGY.

Mr. R. Slimon's Collection of Crustacea will be Exhibited in this Section.

W. Carruthers—Enumeration of British Graptolites.

E. Hull—On the Structure of the Pendle Range, Lancashire, as illustrating the South-Easterly Attenuation of the Carboniferous Sedimentary Rocks of the North of England.

W. S. Mitchell—Second Report on the Alum Bay Leaf Bed.

E. Hull—Observations on the Relative Geological Ages of the Principal Physical Features of the Carboniferous District of Lancashire.

W. Carruthers—On British Fossil Cycadeæ.

W. Carruthers — On Calamiteæ and Fossil Equisetaceæ.

Professor Charles Martins—On the Ancient Glacier of the Valley of Argelez, in the Pyrenees (read in French by the author).

P. W. Stuart Menteath—On Tertiary and Post-tertiary Action in the Pyrenees.

C. W. Peach—On New Fossil Fishes from Caithness and Sutherland.

E. Ray Lankester—On some New Cephalaspidean Fishes.

J. F. Walker—On a New Phosphatic Deposit.

Captain F. Brome—Notice of Recent Discoveries in Caves of Gibraltar, communicated by G. Busk, F.R.S.

Prof. Ansted—On the Lagoons of Eastern Corsica.

Rev. W. H. Crosskey—Notes on the Relation of the Glacial Shell Beds of the Carse of Gowrie to those of the West of Scotland.

John Plant—On the Geology and Fossils of the Lingula Flags at Upper Mawddach, North Wales.

Rev. J. Gunn—On Tertiary and Quarternary Deposits in the Eastern Counties, with reference to Periodical Oscillations of Level and Climate.

SECTION D.—BIOLOGY (DEPARTMENT OF ZOOLOGY AND BOTANY).

Rev. A. Merle Norman—Preliminary Report on the Crustacea, Molluscoida, and Cælenterata, procured by the Shetland Dredging Committee in 1867.

Professor Newton—Supplement to Report on the Didine Birds of the Mascarene Islands.

E. J. Lowe—On the abnormal forms of Ferns.

Prof. Balfour—Notice of some rare Plants recently collected in Scotland.

Dr. Fraser—On the occurrence of a new British Moss in Dovedale.

Dr. Collingwood—On the remarkable Marine Animals observed in the China Seas.

E. Ray Lankester—On the Anatomy of *Patella.*

H. Alleyne Nicholson—On the Nature and Zoological Position of the Graptolidæ.

Dr. Grierson—On the Destruction of Plantations at Drumlanrig by a species of Vole.

Rev. H. B. Tristram—On the Zoological Aspects of the Grouse Disease.

Dr. Lauder Lindsay—On the Conservation of Forests in our Colonies.

Sir James E. Alexander—On the Preservation of Fishing Streams.

C. W. Peach—On Naked-eyed Medusæ, from Peterhead, Wick, and other British Localities, including some new species.

C. W. Peach—On the Fructification of Griffithsia Corallina, found in the West Voe, at the Out Skerries, Shetland.

SECTION D.—BIOLOGY (DEPARTMENT OF ANATOMY AND PHYSIOLOGY).

Dr. C. Collingwood—A new Form of Cephalopodous Ova.

Professor Cleland—To exhibit Microscopical Preparations of the Nerves of the Cornea.

Professor Turner—To exhibit Microscopical Preparations in illustration of the Minute Anatomy of the Nervous System.

Wentworth L. Scott—On the presence of Quinine and other Alkaloids in the Animal Economy.

Dr. Polli—On the Antiseptic Properties of the Sulphides.

R. Dunn—On the Phenomena of Life and Mind.

P. Melville—Life: its Nature, Origin, &c.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Sir R. I. Murchison, Bart., K.C.B.—Announcement of the International Prehistoric and Anthropological Congress for 1867.

M. Lucien de Puydt—Exploration of the Isthmus of Darien, with a view of discovering a Practicable Line for a Ship Canal.

J. Crawfurd, F.R.S.—On the supposed Plurality of the Races of Man.

Cyril Graham, F.R.G.S.—On Exploration in Palestine to the east of Jordan, and on future intended Operations.

J. W. Barnes, C.E.—Exploration of Belochistan and Scind, with a view of an examination of the Subterranean Supply of Water.

J. Crawfurd, F.R.S.—On the History and Migration of Sacchariferous or Sugar-yielding Plants in reference to Ethnology.

W. Perkins—Exploration of the Grand Chaco in La Plata, with an account of the Indians.

Antonio Raimondi—Account of the Wild Indians inhabiting the Forests in the interior of Huanta, Peru, with observations on their Crania compared with those of ancient races.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Professor E. T. Rogers—On the Funds available for Developing the Machinery of Education.

Colonel Sykes, M.P.—Analyses of the Report upon the State of the Empire of France, presented to the Senate and Legislative Body, February, 1867. *(Exposition de la situation de l'Empire, presenté au Senat et au Corps Legislatif. Fevrier*, 1867.*)*

Dr. Cuthbert Collingwood—On the Consumption of Opium.

P. H. Thoms — Observations on Community of Language, and Uniformity of Notation, Weights, Measures, and Coinage.

P. M. Tait—On the Population and Mortality of Calcutta.

Patrick Matthew—Employer and Employed—Capital and Labour.

SECTION G.—MECHANICAL SCIENCE.

James K. Caird—On an Iron Camb for Power Looms.

Admiral Sir E. Belcher, K.C.B.—On the Methods for Testing the Speed of Vessels over the Measured Mile.

James R. Napier, F.R.S., and W. J. Macquorn Rankine, C.E., LL.D., &c.—On Moveable Seats for Slide Valves.

Ferdinand Kohn—On Iron and Steel at the Paris Exhibition.

R. Lewis—On an Improved Marine Steam Boiler.

J. Eckersley—On J. R. Swan's Improved Calcining Kilns.

S. J. Mackie—On Iron Floating Forts, Iron Harbours, and other Floating Structures; and on Daft's Method of Construction of Iron Fabrics.

A. S. Hallidie, C.E.—On an Improved Suspension Bridge.

Professor Macdonald—On an Improved Paddle Wheel.

Wm. Hooper—Electrical Induction.

W. W. Urquhart—On some of the Difficulties the Scientific Engineer meets with in practice.

WEDNESDAY, SEPTEMBER 11th.

Section A.—Mathematical and Physical Science.

C. Wheatstone—On a New Telegraphic Thermometer, and on the Application of the Principle of its Construction to other Meteorological Indicators.

Major Tennant—On Preparations for Observing the Total Solar Eclipse of August 18th, 1868.

R. Russell—On some Deductions by Dr. Tyndall from his recent Experiments regarding the Radiant and Absorptive Properties of Vapour in the Atmosphere.

PARIS EXHIBITION.

The independent competitive trial of steam ploughs, which has already been mentioned in the *Journal*, is appointed to take place on the 19th and 20th of the present month, at Petit-Bourg, on the farm of M. Decauville, a distinguished agriculturist, and at the same time will be tried any kind of sub-soil or other ploughs which turn over or penetrate the earth to the depth of 35 centimetres (14 inches). A considerable number of French and English ploughs are already entered, including the double Brabants of MM. Kondeur and Iscultz frères, the Contgreade and Tweedale ploughs, the subsoil plough of Dombasle of Nancy, the ploughs of Grignon and Bonnet of Avignon, and Howard's great plough. The lists will be open until the 18th instant. The jury will note the depth of the furrows, the extent of surface acted upon, the time occupied by each implement including preparation for the work, the quantity of fuel consumed, the power employed, the number of men and of horses or oxen engaged, the nature of the soil, and any other circumstances which may aid in estimating the cost and quality of the work done. The first day will be devoted to the labours of the jury, and on the second the public will be admitted; the terms and conditions of the competitions are not yet published. Petit-Bourg is not quite an hour's journey from Paris, either by the Lyons or Orleans railway. It is reported that, in consequence of these free competitive trials, the Imperial Commission has renounced its trials altogether; but, if so, there will be an unfortunate blank in the official list of awards at the Exhibition.

A new cooking apparatus, or rather a partially new method of cooking, has appeared in the park of the Exhibition, and has created a great sensation. It is the invention of a Norwegian, and comes with certificates of recommendation from one of the Ministers of Sweden and Norway. The principle is explained in a few words, and anyone may try the efficiency of the system for himself without difficulty; the meat or vegetable to be boiled or stewed is placed in a saucepan with a well-fitting cover but without a handle, and left on the fire for five minutes only after it has attained the boiling point; it is then placed in a box thickly padded on all sides with felt or hair, and, the heat escaping very slowly indeed, the cooking continues. The apparatus is in daily operation, the viands being boiled for five minutes over a gas stove, sealed up in one of the boxes and opened in presence of the public two hours or so afterwards. One of the proposed applications of the invention is cooking for armies or for travellers, and another is the keeping cooked dishes hot for a long period; at the end of eighteen hours the contents of the saucepans are still hot and the flavour of the preparations, it is said, uninjured. It is stated that the system is adopted on board Norwegian and other ships, the economy in water being 20 per cent. besides the immense saving of fuel. This curious invention brings to mind the old query, whether an egg of which the shell is whole gets harder in consequence of the enclosed heat, and seems to answer it in the affirmative; if an egg were boiled for, say, three minutes, then wrapped up in any non-conducting substance and left there for an hour or so, it would supply an illustration on a small scale of the principle of the new system.

As in the case of former great exhibitions, there is a strong disinclination to see the building in the Champ de Mars, or at any rate the great outer circle, destroyed, and one of the proposals put forth for its application merits attention apart from the immediate question. M. Brissac, an engineer, suggests that the present machinery gallery should be converted into a mechanical atelier, with steam or other motive engines of 2,000 horse-power, for the convenience of small manufacturers, and he calculates that thus arranged it would bring an annual rent of about £150,000. The Imperial Commission, in announcing the positive closing of the exhibition on the 31st October, invites tenders for the purchase of the building and materials, to be sent in by the end of the present month. There is also a rumour circulated that the building will be purchased by the Government, and applied to the purposes of a new ministry, which will include the postal and telegraphic services and the Imperial printing establishment.

SUEZ CANAL.

(*Continued from page* 652).

Never before have such extensive earth-works—above all, 500 leagues from Europe, in completely desert country—been undertaken. Not long since, Paris saw the work at the Trocadéro, opposite the Champs de Mars, where four millions of mètres of land were levelled, but this is small in comparison with seventy millions in the Suez Canal. When the Company first began its works it reckoned on the assistance of manual labour in moving this great mass of earth. The Egyptian labourer is quick; he uses no tools; with his hands he excavates the ground, fills baskets, which he carries on his head to the place where the contents are to be overturned to form the rampart or bank. The work is rapid because the labourers are numerous. In any other country but Egypt the cost would be enormous, but in the ancient land of the Pharaohs, where it has been for ages past the custom to make the population pay a portion of their taxes by labour, the employment of men in great public works is not considered in the light of slave labour.

The company, under agreement with Mahomed-Said-Pacha, thought they should do a humane work and ameliorate the lot of the fellahs, in giving them paid work, when they could be legally employed in gratuitous work. The inhabitants were employed in the beginning in constructing the banks of the canal in the Lake Menzaleh; they were made to excavate the fresh water canal, and were afterwards engaged, to the number of 20,000, upon the table land of El Guisr, where they made a cutting for the maritime canal. It was there that the Company, after a long dispute and a decisive arbitration, were, on receiving a certain amount for compensation, deprived of this element of the work. The work was suspended, and it was necessary to extemporise new means of execution, and to substitute machinery for men. The company had to overcome this difficulty; it had been foretold they would have difficulties of all kinds to surmount, obstacles of nature, political jealousies, jealousies of men, &c. The company obtained the assistance of skilful contractors, who had

had great former experience. The company had taken possession of the Desert; it was already established there. The fresh-water canal carried to the centre of the isthmus supplies of material, and drinking water. The works, properly called of the maritime canal were confined nearly to the earth works begun by the fellahs. Some dredging machines of small power had, it is true, been employed to fill up the marshes around Port Saïd, or to deepen the channel opened in Lake Menzaleh. More powerful dredging machines had been ordered, but these measures taken by the company, in expectation of the combination of machines with the fellahs' work would not be sufficient in the new order of affairs. A cutting of two mètres deep, and of unequal breadth, was opened from Port Saïd to Lake Timsah; it was protected by banks which had begun to harden. On the Suez side no vigorous impulse had yet been given to the work. The bank of the Sérapéum had scarcely been raised. It was specially here that the company had reckoned on the work of the people of the country; and if they still had been able to obtain gangs of workmen, which the government of Egypt had before supplied, no doubt that, towards Suez especially, the raising of earth by wheelbarrows and baskets would have been carried on with great activity. In this state of affairs, it was first necessary to order dredging machines of greater power and in greater number, but the question was how to combine this power. It was not enough to turn, by means of steam power, a string of buckets to excavate the soil and raise the earth; it was necessary to empty the contents of the buckets and carry them to some distance, a slow operation, the cost of which might become so great as to render the operation impossible. The ordinary raising of earth by dredging machines is done in a simple manner. The soil is emptied into boxes which come alongside the dredging machine. When the boxes are full, the boat is sent away, and carries them along the bank. Cranes are stationed there, which seize the boxes, raise them, turn them over, and thus throw the soil to a distance of some mètres into the railway trucks. This plan, however easy under ordinary circumstances, becomes slow and costly when it is necessary to operate on considerable masses of material. Operating on this method, it would be impossible to foresee how long the work would take. The necessity was obvious of constructing new apparatus suitable to a work of exceptional importance, the exigencies of which had not been foreseen, and which involved the employment of means hitherto not used.

The principle of the small dredging machines gave the idea of the following apparatus, a model of which is shown in the Exhibition. To empty the material upon the edge, especially in the cuttings at Port Saïd, a trough of wood or sheet iron was placed under the buckets of the dredging machines; it received the material, and let it run to the ground. The inclination of this trough sufficed for the natural fall of mud or of sand extracted by the dredging machine. But this inclination could only be maintained when the dredging machine stood near the bank where the material was to be deposited. When the apparatus was moved back in order to excavate the canal to its centre, for instance, at 50 mètres from the edge of the water, the trough became useless. It could be lengthened, but then it had no slope. The stuff raised and deposited by the dredging machine soon filled the trough, and it would not reach the ground. Then supposing they were dredging in the middle of the canal, it was not only 50 mètres, or half the total width of the canal, which it was necessary to make the trough, but 10 or 20 mètres more, for it was not sufficient to carry the rubbish to the water's edge; it was necessary to throw it further to provide for further widening, and, above all, to avoid the partial falling in of the embankment into the canal itself. A simple solution of the difficulty was found; though simple, it was some time before it was thought of. They at first tried raising the frame of the dredging machine as high as possible, to the summit of which the buckets were carried and turned over after coming out of the water. To avoid this very heavy framing, which would have upset the centre of gravity, dragging the whole thing over, it was strengthened by means of a framework of iron arranged upon the sides, and supported on a barge. At the height where the buckets empty the stuff brought from below, is placed the trough. In some cases it is 70 mètres long. This trough may be considered as a column of sheet iron cut from the top to the bottom, half of which is so placed as to form a bridge, leading from the dredging machine to the land. This aqueduct bridge is sustained between the dredging machine and the ground by a solid support, resting upon a barge or flat-bottomed boat, but not touching the bank. It is kept at a certain height above the soil, so that the material can fall readily on the ground when it has run from the top to the bottom of the trough. The principal difficulty to surmount was the want of slope in the trough, which was necessarily small on account of its length, and the small elevation of its end next the dredging machine. It was therefore not easy to get the material to run to the end of the trough. Several plans had been tried in shorter troughs; men provided with poles and rakes had pushed the material which stopped on its way, and cleared out the trough; but this plan on the required scale was too insignificant and costly. It was remarked, however, that the buckets in emptying the stuff into the troughs sometimes discharged a certain quantity of water, which was carried up mixed with solid material. This water, descending in fine streams, and introduced between the masses of earth and sand, united with them in the trough, disintegrated them, and finally washed them away; this gave the idea of introducing in the trough a current of water, neither too strong nor too weak; if too strong it would have run over the edge, if too weak the mass of earth would have absorbed it. Pumps were placed near the dredging machines, driven by steam, and water was made to run constantly into the trough, which carried with it the solid products of the dredging machine. This great trough arrangement forms the all important machine for piercing the isthmus. The canal is 160 kilometres from Port Saïd to Suez; more than a third will be dug out by means of this long trough with an ease and economy which it was impossible to have foreseen. The company can triumphantly show this invention to those of its detractors who had speculated on the works of the canal being abandoned when deprived of the native workmen. Whenever the banks of the canal are not too high, the long trough can be used to advantage. A great number of dredging machines ranged along the canal are provided with this instrument. Where the slope of the long trough has been inverse, that is, inclining from the bank to the dredging machine, it has been necessary to build a dredging machine expressly to overcome this difficulty.

The model of an iron elevator is shown; it was not possible to show the apparatus itself, because it is in use in Egypt, and belongs to the contractor and not to the company; besides, a collection of dredging machines, with the long trough, an elevator, a dry excavator, and two boat supports, represent a capital of more than two million francs, without reckoning the expense of carriage and the loss of the use of these machines for a year; and besides, to exhibit them properly at work the Canal Company would have required the use of one whole side of the Champ de Mars, and the expense of erection would have amounted to a million francs. The elevator apparatus consists of two inclined girders of iron, fourteen mètres high; between these supports an endless chain turns, moved by steam, and upon this chain a vessel is attached, which, arriving at the top, is overturned, and discharges the stuff brought up. The stuff is brought up in boxes, hooked to carriages, and descends, when emptied, on the endless chain. There are eighteen of these elevators at work. The earth is carried to the bank by means of long troughs when the soil is lower than the dredging machines, and by elevators when the soil is higher, so it only remains to provide for the conveyance of material where it cannot be deposited on the bank. For this purpose transport vessels have been built; some are made for sea use. Two decks are placed, one before and the other in the after part of the vessel, for the use of the crew and for working. The centre of the vessel is reserved for the stuff dredged up; it is separated into two cavities by a partition, reaching to the bottom of the vessel, and these are filled with the soil. When these receptacles are full the transport vessel is taken to sea, and by means of a lever the chains which hold the trap doors descend and let fall the material contained in the boat, which returns again under the dredging machine for a fresh load. Other boats of the same kind, with the same appliances, are intended to be used exclusively in the lagoons which the canal passes through. In some vessels the doors are at the bottom, in others at the side; they are made wide and flat, as is necessary for river boats, instead of being narrowed towards the keel like sea boats. There is also a dry excavator shown in full work, and one glance will show its mechanism and utility.

These are the principal models shown by the company; they comprehend the different combinations which have been adopted to excavate the canal and clear away the earth.

These machines, which for the most part present important improvements, are ingenious, economical, and above all practical. The science of dredging was in its infancy when the Suez Canal was commenced; dredging machines had not been employed on any great scale. Necessity is the mother of invention. After the example of what has been accomplished by the genius and perseverance of those employed by the Suez Canal Company, the difficulty of removing the greatest quantity of earth from under the water need no longer be feared. The company were deprived of the assistance of native workmen, and have substituted machines. No sufficiently powerful machines previously existed; it has created them, giving them a power hitherto unknown. The company has done great things; it has peopled a desert, built towns, introduced currency and industry into the isthmus; learning, civilization, and religion have been diffused.

The system of towage, invented by M. Bouquié, and called after him, has been adopted for the provisional transport of goods from one sea to the other by means of the fresh water canal. The system is that known as the immersed chain, upon which the towing vessel hauls itself along, drawing in its train barges laden with thousands of tons of merchandise. The advanced state of the works in the part of the canal leading from Port Saïd to Ismaïla, and the complete construction of the fresh water canal, which, coming to Zagazig, thence descends directly on Suez, have enabled the company to arrange a regular service for the conveyance of merchandise and passengers from one sea to another. Numerous barges, destined to receive the cargoes, have been sent to Port Saïd, and are floating in the canal. A double system of traction has been adopted in the maritime canal, and, provisionally, six steam-boats tow the barges loaded from Port Saïd to Ismaïla, and *vice versâ*.

In the fresh water canal a system of towage has been established. Six tugs perform the service. Two are screw boats, built according to the usual plan, measuring 20 mètres long and 4 mètres wide, of 100 horse-power. The system of towage practised at the Canal Saint Martin, Paris, of which M. Bouquié is the inventor, has been adopted, as being at the same time the most simple and appropriate to the conditions of transit in the isthmus. The tugs employed will be 20 mètres long by 3·50 mètres wide, and are each furnished with an engine of 18 horse-power. The chain by means of which the traction is effected runs over a pulley with teeth, each link of the chain fitting exactly to the tooth of the wheel, which is placed on one of the sides of the tug, an arrangement which allows the chain to be taken hold of and released with the greatest ease. This system has the advantages over the ordinary towage of greater lightness and greater simplicity of machinery, being easier to manage in starting or stopping, or for the passing of two tugs going in opposite directions on the same chain. The conveyance of merchandise and passengers from one sea to another is now managed so as to convey 1,000 tons per day through the isthmus. The Canal Company have thus started its works.

A model of the works established at Ismaïla, by M. Lasseron, is shown. Their object is to convey fresh water to Port Saïd, 80 kilometres distant. M. Lasseron's arrangements work well.

INDUSTRIAL EDUCATION AT CREUSOT.

The following is from the *Pall Mall Gazette* of August 31st:—

The illustrations of the system of education provided for the families of the skilled workmen at Creusot (departement de Saone et Loire) which have been presented to the South Kensington Museum are a valuable and timely gift. We can only regret that the admirable specimens of the actual work executed by these trained men, which fill a large building in the garden of the Paris Exhibition, cannot be added to the handsome gifts of M. Schneider, and exhibited along with them at the Kensington Museum, because by being separated they lose half their value. At Paris you not only see examples of the method of training and the work drawn by the pupils in the schools, but when you have reached the Englishman's conclusion that all this is very fine in theory, but won't do in the practice of life, you turn round to the works which these youths so trained have afterwards executed in the workshops, and you find yourself compelled to own, perhaps reluctantly, that no better work has ever been produced in England.

Creusot may be said to form a kind of model manufacturing community, all placed under the direction of a single individual or firm, and consisting of 24,000 inhabitants. The number of workmen employed is 9,950; the steam power is equal to that of 9,750 horses. There are coal mines which produce 250,000 tons annually. There are iron mines which produce 250,000 tons of minerals per annum; and the annual production of cast iron is 130,000 tons. But it is not in the mere production of raw material that this community expends its skill. It converts its cast iron into all the forms of wrought iron employed in the manufacture of machinery, or in the construction of large engineering works. In the course of a year it turns out 100 locomotives, or about two a week. Although situated far inland, with no direct temptation to undertake naval engineering, it exhibits numerous samples of marine steam engines (one of 950 horse-power) for the iron-clad ships of the Imperial navy.

It is from the examination of these works that we turn to the exhibition on the walls, and there see the moral and intellectual and social organization by which they have been accomplished. From their earliest youth the children of the workmen, male and female, are trained in schools organized by M. Schneider. A large plan and model of the commune of Creusot, pictures of the habitations for workmen, churches, hospitals, and schools, show the admirable provision which is made for the people of Creusot in these respects. Statistical tables illustrate the progress and changes of the population; these are divided into two parts—the one showing the progress of their material welfare, their accumulation of property, and their consumption of food and luxuries; the other showing the amount of attendance at schools, the relative statistics of individual success in these schools, and the subsequent rank attained by each pupil in the manufactories. From these we gather that the progress of education has always been followed by improved moral character and advanced social well-being;

that the pupils who have most successfully availed themselves of the technical schools are those who have afterwards risen to the highest ranks as foremen, clerks, superintendents, overseers, and engineers in the works themselves. And they prove, moreover, a most important doctrine for us, that there is a kind of education which, instead of putting a workman above his work, enables him to do it more to the satisfaction of his employer, and to his own honour, and better for his own personal advancement. The nature of the instruction given in the school is shown in a series of detailed tables now hung on the walls of the Paris Exhibition. These tables comprise the organization of the schools, the programme of subjects taught, distribution of the pupils' time, samples of their mechanical and mathematical drawings, samples of their hand and eye sketches, examples of writing and French composition, lists of their studies in religion, sacred history, French history, and geography; studies in arithmetic, algebra, elementary geometry, and descriptive geometry; specimens of ornamental writing and map drawing. These are for boys. But the girls are also well educated, with the difference that for plan drawing and geometry are substituted needlework and dressmaking. They are also taught book-keeping.

There is one point on which M. Schneider speaks almost with the air of an injured man: after his pupils have been trained in his schools and put through their apprenticeship in his works, they are coveted on all sides by other manufacturers, and stolen from him in large numbers. We are not sure that M. Schneider does not make this complaint with a quiet internal chuckle of self-complacency, that he not only manufactures good skilled artizans, but also finds them good masters. Seriously, we do not think M. Schneider is very sorry. We do not think that his giving us, his rivals, all this information looks very narrow-minded; and the candid way in which he lays before us on the walls of the Exhibition the cost price of his goods, the revenue he gets in return, and the mode in which that is expended in wages, materials, and the well-being of the community, suggests that he seeks his chief reward in the prosperity of his people and in the example which he offers for imitation to the world.

In conclusion we would venture to suggest to M. Schneider a very simple way in which he may add to the benefit which his gift to the Kensington Museum confers on the British community. A great deal of the most valuable information he gives consists in printed tables and engravings. Would he be kind enough to give a copy of each of these to the chambers of commerce or town councils of such manufacturing towns as Manchester, Birmingham, Leeds, Sheffield, Newcastle, and Glasgow? In this way he would enable the different classes of these communities to see, and judge between the two great principles of social organization—the one principle of every man for himself, and the other of every man for the general good. They would be enabled to see in the example of Creusot how combinations may be formed, not of one class against every other class, but of each for the benefit of all.

Fine Arts.

Presentation of Works of Art to Public Establishments by the French Government.—The usual report of presentations of works of art by the Ministry of the Fine Arts on the occasion of the Imperial Fêtes, has just appeared, and is of unusual length; the recipients include churches and chapels in sixty-four departments of France, and in Algeria; the four great public libraries of Paris; the Senate, and the Corps Legislatif; the Council of State; the Institut; the Sorbonne; the Archives of the Empire; the Museum of Natural History; the Louvre; the Conservatoire des Arts et Metiers; seven Imperial and special schools; the Union Centrale of Applied Art; the Imprimerie Impériale, and the Geographical Society; and more than two hundred museums, libraries, and scientific and artistic institutions in the provinces. The Minister of the Beaux Arts is a splendid customer to the artists of France.

Commerce.

Mineral Statistics.—Mr. Robert Hunt, F.R.S., Keeper of Mining Records, has issued his "Mineral Statistics of the United Kingdom" for the year 1866. Sir Roderick Murchison, in the preface, draws attention to the remarkable increase in the production of coal during the past year, notwithstanding the depression in many manufactures, and especially in that of iron. It appears that the collieries of the United Kingdom produced, during the year, the enormous quantity of 101,000,000 tons of coal. The estimated value of that coal is £25,407,635. The quantity of iron raised in 1866 was 9,665,012 tons, which produced in metals, 4,523,897 tons; the estimated value of the raw material being £3,119,098, and of the manufactured £11,309,742. The following is a summary of the returns of coal produced in the various colliery districts of Great Britain and Ireland during the year 1866:—Durham and Northumberland, 25,194,550 tons; Cumberland, 1,490,481; Yorkshire, 9,714,700; Derbyshire, 4,750,520; Nottinghamshire, 1,600,560; Leicestershire, 866,560; Warwickshire, 775,000; Staffordshire and Worcestershire, 12,298,580; Lancashire, 12,320,500; Cheshire, 895,500; Shropshire, 1,220,700; Gloucestershire and Somersetshire, 1,850,700; Monmouthshire, 4,445,000; South Wales, 9,376,443; North Wales, 2,082,000; Scotland, 12,625,000; Ireland, 123,750. Total produce of the United Kingdom, 101,630,544 tons. This gives an increase of 3,479,957 tons in 1866 over the production of the previous year. In 1856 there were 2,815 collieries in England and Wales, and in 1866 there were 3,188. The quantity of iron ore produced in this country last year was 9,665,012 tons; about 300,000 tons less than the quantity returned in 1865. In the same period the quantity of pig iron made was 4,530,051 tons, or 289,203 tons less than the production of our blast furnaces in the previous year. The estimated value of iron ore raised in the United Kingdom amounted to £3,119,098 19s. 6d. Foreign ore imported, 56,689 tons; custom-house value, £49,081; making a total quantity of 9,721,701 tons converted into iron. The number of furnaces in blast were 618. Pig iron produced: In England, 2,576,928 tons; in Wales 959,123 tons; in Scotland, 994,000 tons. Total production of pig iron in Great Britain, 4,530,051 tons. This quantity, estimated at the mean average cost at the place of production, would have a value of £11,309,742.

Colonies.

Australian Vine-growing.—The following are the yields of some of the principal vineyards in the western districts of Victoria, in 1867, compared with the yield of the same vineyards in 1866:—

		1866.	1867.
Guarwarre ..	11 acres ..	5 hhds. ..	22 hhds.
,,	16 ,, ..	1,500 galls. ..	1,500 galls.
,,	6 ,, ..	,, ,, ..	1,000 ,,
Ceres	8 ,, ..	1,200 ,, ..	2,000 ,,
Duneed	16 ,, ..	3,000* ,, ..	—
Frogmore ..	4 ,, ..	21 hhds. ..	—
Moorabool ..	20 ,, ..	2,500 galls. ..	7,000 ,,

On a whole showing a decrease in the yield, which was caused by dry winds and weather in the early part of the season, and by wet weather lately causing the grapes to burst.

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* And sold 25 tons of grapes.

Notes.

Sewerage of Paris.—A very important work has been some time under hand in the western portion of the city, namely, a second great *égout collecteur*, the object of which is to prevent the contamination of the whole horse-shoe bend of the Seine which encloses the Bois de Boulogne. The new main drain commences at the Place de l'Alma, nearly opposite the Exhibition, and will terminate at Neuilly, a distance of between three and four miles. The work is being performed by tunnelling, and by means of shafts 60 to 80 feet deep, and 150 feet apart. This sewer will carry the drainage of the left bank of the Seine, after it has crossed the river by means of a syphon, to a spot just below the island of Neuilly, and thus probably keep out impurities from the Seine for a distance of nine or ten miles, the bend of the river being very sharp in this part; it will also serve to convey away the water of a very dirty little stream, called the Bièvre.

Correspondence.

Artizans' Visits to Paris. — Sir, — Permit me, through the columns of the *Journal*, to express my views as to the admirable arrangements made by the British Commission to aid the inquiries and add to the comfort of artizans visiting the Paris International Exhibition, now open. At the request of the Birmingham Chamber of Commerce, I accompanied 25 representatives of the industries of Birmingham sent by the Society of Arts, and my experience is that no means was spared by those in attendance at the British Workmen's Hall to render the object and intentions of the visit practically useful. The indefatigable exertions of Mons. Haussoullier secured for the Birmingham representatives admission to the leading establishments engaged in the production of works in the precious metals, bronzes, gas-fittings, plumbers' work, brass founding, railway carriages, the mint, die-sinking, gun-making, tin and copper working, japanning, and galvano-plastic works. Moreover, through the introductions given by him, the artizan visitors were also provided with intelligent guides and interpreters, who became the medium of communication through which questions were asked and answers received. The Workmen's Hall serves also the purpose of a reading room, the tables being covered with English and other papers, periodicals, literary and scientific, and reports on the trades of Paris. On the walls are hung carefully-prepared lists of places, with the days and conditions under which they may be visited; pens and ink afford the means of letter-writing. Altogether the arrangements of the British Workmen's Hall are of the most satisfactory and efficient kind; it is a place of meeting—a quiet retreat for a few minutes from the bustle and heat of the interior of the Exhibition building. Having for ten days been a daily witness to the useful and efficient working of the arrangements in the British Workmen's Hall, and the untiring courtesies and labours of Mons. Haussoullier, in whose care the British Commission have placed the hall, I have much pleasure in bearing my testimony on the subject. Trusting you will give this a corner in your *Journal*, I am, &c., W. C. Aitken.

Birmingham, September 11, 1867.

Patents.

From Commissioners of Patents' Journal, September 6th.

Grants of Provisional Protection.

Agricultural implements, &c.—2426—J. Phillips-Smith.
Boilers, measuring water to—2422—J. Varley.
Boilers, supplying water to—2430—H. and D. Davey.
Bottle stoppers—2418—D. Taylor.
Carriages—2262—J. G. Tongue.
Cartridge cases—2318—W. T. Eley.
Chocolate and cocoa—2102—C. Klug.
Coining presses—2398—J. M. Napier.
Gas, &c.—2414—J. L. Norton and G. Hawksley.
Hurdles, lifts, and fencing—2396—J. Sainty.
Liquids, raising by steam power—2408—A. M. Clark.
Looms—2416—D. Whittaker.
Lubricators—2404—S. Lynes.
Metal joints—2406—W. Newsome.
Omnibuses, registering number of passengers carried in—2392—W. Thomas.
Printing types, setting up and distributing—2432—P. Kniaghininsky, P. Galahoff, and N. Ossipoff.
Processes, solvent or detergent—2410—J. G. Marshall.
Reaping and mowing machines—2260—A. C. Bamlett.
Sewing machines—2428—M. Samuelson.
Ships, constructing—2412—T. W. Lawson.
Spools, reels, &c.—2390—W. Bostock.
Towels—2424—J. and J. Cash.
Tubes, waterproof—2394—G. Luyckx.
Umbrellas and parasols—2400—T. Widdowson.
Valves—2402—T. Sault.

Inventions with Complete Specifications Filed.

Water, aëration of fresh—2452—J. H. Johnson.
Metallic surfaces, bronzing—2453—J. Storey, W. E. Bickerdike, and W. V. Wilson.
Carpet stretcher and tack driver—2475—A. H. Brandon.
Fire-arms, breech-loading—2488—W. R. Pape.

Patents Sealed.

654. F. Pope.
676. J. S. Gisborne.
678. G. Glover.
687. A. Kimball.
693. W. Dempsey.
696. M. P. W. Boulton.
703. B. P. Walker.
707. J. F. Brinjes.
715. J. Willcock and S. Mason.
720. T. and T. F. Walker.
723. F. R. A. Glover.
738. P. T. Goodwin.
760. W. R. Harris.
790. J. Hislop.
792. A. V. Newton.
806. S. M. Tyler.
826. W. D. Player.
829. C. Kaufmann.
889. J. M. Jomain.
1068. A. V. Newton.
1524. A. M. Clark.
1642. M. Cavanagh.
1973. W. R. Lake.
2089. H. A. Bonneville.

From Commissioners of Patents' Journal, September 10th.

Patents Sealed.

702. T. Burt.
708. J. Fox.
718. J. Thévenet.
719. J. Boyd.
721. J. Hamilton.
725. G. Rumbelow and H. Kendall.
726. W. Wootton.
727. J. Griffith.
728. B. Platt.
729. J. C. Morrell.
730. W. Esplen & J. J. B. Bland.
732. E. Lee.
747. E. P. Plenty.
753. N. Thompson.
762. J. Grundy.
766. J. Hickisson.
772. J. Shand.
778. H. Simms.
804. T. K. Mace.
841. J. Spencer.
892. G. R. Postlethwaite.
899. A. Turner & W. E. Newton.
907. W. Crighton.
930. A. Barff and J. Kidd.
1880. W. R. Lake.

Patents on which the Stamp Duty of £50 has been Paid.

2161. R. A. Brooman.
2163. J. Ivers and T. Ogden.
2196. A. V. Newton.
2178. T. H. Baker and T. Woodroffe.
2168. T. E. Symonds.
2177. D. Walker.
2181. W. H. Perkin.
2195. G. Bedson.
2193. J. Fleming.
2351. W. Whittle.
2203. H. D. P. Cunningham.
2212. L. F. Goodbody.
2237. Z. S. Durfee.
2253. A. M. Perkins.

Patents on which the Stamp Duty of £100 has been Paid.

2144. G. Bedson.
2166. J. Hamilton.
2184. T., E., and J. Thornton.

Registered Designs.

4875—August 9th—Fastening for the handles of brooms and other articles—W. Gibson, Birmingham.
4876—August 10th—Screw wrench—J. Asbury, Balsall-heath, Birmingham.
4877—August 14th—A stay bust fastening—Helby and Sons, Portsea.
4878—August 20th—An improved loom picker—J. Sharpe, Park-road, Bradford, Yorks.
4879—August 26th—A ratchet die for cutting screws on pipes—J. W. Taylor, T. Andrew, and S. H. Stephens, Commercial-street, E.C.